



**Missouri Department of Natural Resources**  
**Air Pollution Control Program**

2003-11-053

Noranda, Inc.

1 Brentwood Commons, Suite 175 - 250 Old Hickory Road,  
Brentwood, TN 37027

Noranda Aluminum, Inc.

#1 Robbins Road, St. Jude Industrial Park, P.O. Box 70, New  
Madrid, MO 63869

New Madrid County, S32, T22N, R14E

Increase aluminum production at an existing primary aluminum plant. This review was conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*.

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## SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

*The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060 paragraph (12)(A)10. "Conditions required by permitting authority."*

Noranda Aluminum, Inc.  
New Madrid County, S29, T22N, R14E

1. Annual Emission Limitation
  - A. Noranda Aluminum, Inc. shall emit less than 3,878 tons of Sulfur Oxides (SO<sub>x</sub>) from entire installation in any consecutive 12-month period.
  - B. Noranda Aluminum, Inc. shall maintain a record of the sulfur content of the petroleum coke used in anode production. The sulfur content must be tested by Noranda Aluminum Inc. or verified by supplier certification. The sulfur content must be used in determining SO<sub>x</sub> emissions from the all processes where petroleum coke is used.
  - C. Attachment A or equivalent forms approved by the Air Pollution Control Program shall be used to demonstrate compliance with Special Conditions 1(A) and 1(B). A copy of any sulfur content verification documentation shall be kept with Attachment A. Noranda Aluminum, Inc. shall maintain all records required by this permit for not less than five (5) years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.
  - D. Noranda Aluminum, Inc. shall report to the Air Pollution Control Program's Enforcement Section, P.O. Box 176, Jefferson City, Missouri 65102, no later than ten (10) days after the end of the month during which the records from Special Condition Number 1(C) indicate that the source exceeds the limitation of Special Condition Number 1(A).
2. Emission Limitation for Raw Material Handling
 

Noranda Aluminum, Inc. shall not discharge Particulate Matter less than ten microns in diameter (PM<sub>10</sub>) into the atmosphere from the stacks listed in Attachment B of this permit in excess of the amounts listed in Attachment B of this permit. These emission rates shall be verified through compliance testing, as detailed in Special Condition 7.
3. Emission Limitation for Potline 1
  - A. Noranda Aluminum, Inc. shall achieve the Best Available Control

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# SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

- Technology (BACT) limitation for PM<sub>10</sub> of 55.08 pounds per hour from Potline 1 Monitor (EP59).
- B. Noranda Aluminum, Inc. shall achieve the BACT limitation for PM<sub>10</sub> of 29.0 pounds per hour from Potline 1 & 2 Stack (EP61).
- C. Noranda Aluminum, Inc. shall achieve the BACT limitation for Carbon Monoxide (CO) of 2,391 pounds per hour from Potline 1 Stack (EP61).
- D. Noranda Aluminum, Inc. shall achieve the BACT limitation for combined fluorides of 1.9 pounds per tons of aluminum produced from Potline 1 Stack and Potline 1 Monitor (EP61 and EP59).
4. Emission Limitation for Potline 2
  - A. Noranda Aluminum, Inc. shall achieve the BACT limitation for PM<sub>10</sub> of 31.14 pounds per hour from Potline 2 Monitor (EP60).
  - B. Noranda Aluminum, Inc. shall achieve the BACT limitation for CO of 2,391 pounds per hour from Potline 2 Stack (EP61).
  - C. Noranda Aluminum, Inc. shall achieve the BACT limitation for combined fluorides of 1.9 pounds per tons of aluminum produced from Potline 2 Stack and Potline 2 Monitor (EP61 and EP60).
5. Emission Limitation for Potline 3 East and West
  - A. Noranda Aluminum, Inc. shall achieve the BACT limitation for PM<sub>10</sub> of 22.27 pounds per hour from Potline 3 Monitor (EP64).
  - B. Noranda Aluminum, Inc. shall achieve the BACT limitation for PM<sub>10</sub> of 7.25 pounds per hour from Potline 3 East Stack (EP62) and 7.25 pounds per hour from Potline 3 West Stack (EP63).
  - C. Noranda Aluminum, Inc. shall achieve the BACT limitation for CO of 1,469 pounds per hour from Potline 3 East Stack (EP62) and 1,469 pounds per hour from Potline 3 West Stack (EP63).
  - D. Noranda Aluminum, Inc. shall achieve the BACT limitation for combined fluorides of 1.9 pounds per tons of aluminum produced from Potline 3 East and West Stacks and Potline 3 Monitor (EP62, EP63 and EP64).
6. Monitoring Requirements  
Noranda Aluminum Inc. shall install, calibrate, maintain and operate continuous

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## SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

emissions monitoring systems (CEMS) and record the output of the systems for Potlines 1, 2 & 3. These monitors shall measure the emission rates of PM<sub>10</sub>, CO, and fluorides to demonstrate compliance with the emission limitations from Special Conditions 3, 4, and 5. Emission data shall be collected by the CEMS in accordance with 40 CFR Part 75.

### 7. Compliance Testing Requirements

- A. Initial stack tests shall be performed to verify that the emission limitations set in Special Conditions 3, 4, and 5 are not exceeded. These tests shall be performed as specified in the Stack Test Procedures outlined in Special Condition 8.
- B. Noranda Aluminum, Inc. shall conduct performance testing on the equipment listed in Attachment B sufficient to quantify the emission rates of PM<sub>10</sub> from these sources as specified in Special Condition 2. This testing may be limited to conducting tests on a representative piece(s) of each type of equipment upon approval by the Director. In addition, an alternate method(s) of quantifying the emission rates of PM<sub>10</sub> from these sources may be used in place of the above testing requirement if requested by Noranda Aluminum, Inc. and approved by the Director.
- C. Noranda Aluminum, Inc. shall conduct performance testing on the equipment listed in Attachment B once every 5 years to ensure compliance with Special Condition 2.
- D. Performance tests shall be performed within sixty (60) days after achieving the maximum production rate of the installation, but not later than 180 days after initial start-up of each aluminum potline. These tests shall be performed according to the requirements found at 40 CFR Part 63 Subpart LL and Subpart RR and 40 CFR Part 60 Subpart S, as applicable. These performance testing will be supplemented with the appropriate PM<sub>10</sub>, CO, and fluoride test methods to demonstrate compliance with Special Conditions 3, 4, and 5. These performance tests shall comply with Special Condition 8.

### 8. Proposed Test Plan

- A. The date on which performance tests are conducted must be pre-arranged with the Air Pollution Control Program (APCP) a minimum of 30-days prior to the proposed test date so that this Program may arrange a pretest meeting, if necessary, and assure that the test date is acceptable for an observer to be present. A completed Proposed Test Plan form (copy enclosed) may serve the purpose of notification and must be approved by

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# SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

the APCP prior to conducting the required emission testing.

- B. Two copies of a written report of the performance test results shall be submitted to the Director of the APCP within 30-days of completion of any required testing. The report must include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required EPA Method for at least one sample run.
  - C. The test report is to fully account for all operational and emission parameters addressed both in the permit conditions as well as in any other applicable state or federal rules or regulations.
  - D. If the performance testing required by Special Conditions 7 of this permit indicate that any of the emission rates or control efficiencies specified in Special Conditions 3, 4, and 5 are being exceeded, Noranda Aluminum, Inc. must propose a plan to the APCP within thirty (30) days of submitting the performance test results. This plan must demonstrate how Noranda Aluminum, Inc. will reduce the emission rates below those stated in Special Condition 3, 4, and 5. Noranda Aluminum, Inc. shall implement any such plan immediately upon its approval by the Director.
9. Capture and Control Equipment Requirements – PM<sub>10</sub> Emissions
- A. Noranda Aluminum, Inc. shall capture emissions from the Potlines 1, 2 & 3 using capture hoods as specified in the permit application for a capture efficiency of at least 95 percent to achieve the BACT.
  - B. Noranda Aluminum, Inc. shall control emissions from the Potlines 1, 2 & 3 using a dry alumina scrubber connected to baghouses as specified in the permit application for a control efficiency of at least 97 percent to achieve the BACT.
  - C. The capture hoods and dry alumina scrubber with baghouse must be in use at all times when the aluminum potlines are in operation. The dry alumina scrubber with baghouse shall be operated and maintained in accordance with the manufacturer's specifications.
  - D. The baghouse shall be equipped with a gauge or meter, which indicates the pressure drop across the control device. These gauges or meters shall be located such that the DNR employees may easily observe them. Replacement filters for the baghouses shall be kept on hand at all times. The bags shall be made of fibers appropriate for operating conditions expected to occur (i.e. temperature limits, acidic and alkali resistance, and

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# SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

abrasion resistance).

- E. Noranda Aluminum, Inc. shall monitor and record the operating pressure drop across the baghouses at least once every 24 hours. The operating pressure drop shall be maintained within the design conditions specified by the manufacturer's performance warranty.
  - F. Noranda Aluminum, Inc. shall develop and maintain a monitoring plan that:
    - 1) Identifies the operating parameter(s) to be monitored to assure capture efficiency,
    - 2) Explains why this parameter is appropriate for demonstrating ongoing compliance,
    - 3) Identifies the specific monitoring procedures, and
    - 4) Specifies the operating parameter value or range of values (or the procedures for establishing the values) that shall be maintained to demonstrate capture efficiency is being maintained.
  - G. The capture efficiency operating parameter(s) identified in Special Condition 9(F) shall be continuously monitored when the aluminum potlines are in operation. The most recent sixty (60) months of records shall be maintained on-site and shall be made immediately available to Missouri Department of Natural Resources' personnel upon request.
  - H. Noranda Aluminum, Inc. shall maintain an operating and maintenance log for the capture and control systems (enclosures and scrubber with baghouse) for a period of (60) sixty months which shall include the following:
    - 1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
    - 2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
    - 3) A written record of regular inspection schedule, the date and results of all inspections including any actions or maintenance activities that result from that inspection.
10. Restriction of Public Access
- Noranda Aluminum, Inc. shall preclude all public access to Noranda Aluminum, Inc.'s declared property boundary. Noranda Aluminum, Inc. shall submit documentation to demonstrate preclusion to the Air Pollution Control Program for review and approval.

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## SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

### 11. Conditions Resulting from Ambient Air Quality Analyses

Noranda Aluminum, Inc. shall install, operate and maintain a system of ambient air monitoring stations for fluoride. Noranda Aluminum, Inc. shall install, operate and maintain this ambient fluoride monitoring network according to the following specifications:

- A. The initial fluoride monitoring network approved under this permit shall consist of at least three (3) ambient monitors.
- B. Noranda Aluminum, Inc. will conduct meteorological monitoring in conjunction with the fluoride monitoring plan. This meteorological monitoring will occur at a minimum of one (1) site as described by an approved Quality Assurance Project Plan (QAPP) for meteorological data and continue for the duration of the fluoride monitoring.
- C. Noranda Aluminum, Inc. shall locate all fluoride monitors such that the monitors will measure *ambient* air quality, as approved by the department.
- D. Noranda Aluminum, Inc. shall report the data collected in accordance with this special condition to the department on a quarterly basis.
- E. If concentrations are monitored that exceed the Risk Assessment Level (RAL), Noranda Aluminum, Inc. shall report the monitored information (the beginning and ending date and time, and the value for the applicable standard time period) within seven (7) days of the event.
- F. Concentrations resulting from this monitoring greater than the RAL and attributed to operations permitted herein represent cause for reopening this permit. Noranda Aluminum, Inc. shall:
  - 1) conduct a comprehensive review of the results and develop a correction plan;
  - 2) submit the corrective action plan to the permitting authority for approval; and,
  - 3) implement the corrective action plan immediately upon department approval.
- G. Noranda Aluminum, Inc. shall submit a QAPP for fluoride for department approval no more than three (7) months before commencing operation.
- H. The QAPP will contain the specifications of the monitoring program noted above and include:
  - 1) the conditions under which the monitoring may be discontinued;
  - 2) date sampling will commence. Sampling will begin no later than the commencing of operation; and,
  - 3) the nature of the information to be reported (e.g. hourly concentrations).
- I) In conjunction with the fluoride monitoring program above, Noranda Aluminum, Inc. shall perform a risk assessment study. Noranda Aluminum, Inc. should contact the Air Pollution Control Program to establish the minimum criteria that must be met for collection and

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The permittee is authorized to construct and operate subject to the following special conditions:

reporting purposes. If the risk assessment indicates that adverse health impact are likely, Noranda Aluminum Inc. shall:

- 1) conduct a comprehensive review of the results and develop a correction plan;
- 2) submit the corrective action plan to the permitting authority for approval; and,
- 3) implement the corrective action plan immediately upon department approval.

Draft

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE  
SECTION (8) REVIEW

Project Number: 2003-11-053  
Installation ID Number: 143-0008  
Permit Number:

Noranda Aluminum, Inc.  
#1 Robbins Road  
St. Jude Industrial Park, P.O. Box 70  
New Madrid, MO 63869

Complete: April 6, 2004  
Reviewed: June 4, 2004

Parent Company:  
Noranda, Inc.  
1 Brentwood Commons  
Suite 175 - 250 Old Hickory Road  
Brentwood, TN 37027

New Madrid County, S32, T22N, R14E

REVIEW SUMMARY

- Noranda Aluminum, Inc. has applied for authority to increase aluminum production.
- Hazardous Air Pollutant (HAP) emissions are not expected from the proposed equipment.
- Subpart S of the New Source Performance Standards (NSPS) applies to the potroom groups and anode bake plants at this primary aluminum reduction plant.
- The Maximum Achievable Control Technology (MACT) standard, 40 CFR Part 63, Subpart LL, National Emission Standards for Primary Aluminum Reduction Plants, and Subpart RRR, National Emission Standards for Secondary Aluminum Production, applies to the proposed equipment.
- Applicable control equipment following BACT is being used for the aluminum potlines.
- The increase in the potential emissions of CO, PM<sub>10</sub> and fluoride are above de minimis levels, and the existing installation is considered to be a major source. Therefore, this review was conducted in accordance with Section (8) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*.
- This installation is located in New Madrid County, an attainment area for all criteria air pollutants.

- This installation is on the List of Named Installations [10 CSR 10-6.020(3)(B), Table 2, Number 6 *Primary Aluminum Ore Reduction Plants*].
- Ambient air quality modeling was performed to determine the ambient impact of CO, PM<sub>10</sub> and fluoride.
- Emissions testing is required for the source to demonstrate compliance with NSPS and MACT Standards and emissions limitations set forth in this construction permit.
- Revision to the Part 70 Operating Permit application is required for this installation within 1 year of equipment startup.
- Approval of this permit is recommended with special conditions.

### INSTALLATION DESCRIPTION

Noranda Aluminum, Inc. operates a primary aluminum refining operation in New Madrid County. The company is an existing primary aluminum reduction installation but is also involved in secondary aluminum production. Alumina (Al<sub>2</sub>O<sub>3</sub>) is received at the plant and undergoes electrolytic reduction, known as the Hall-Heroult process, to obtain aluminum. The electrolytic reduction takes place in shallow carbon-lined steel shells called pots. The anodes are carbon electrodes extending into the pot, and the cathode is the carbon lining within the pot.

In the reduction of alumina, carbon, in the form of an anode, is negatively charged to react with the alumina. The anode, also called green anode, is continuously depleted until it is a stub. These anodes are prepared with petroleum coke mixed with pitch binder to make a paste. The coke is crushed, ground, and screened before being mixed with the pitch binder. The paste is added directly to the anode casings and baked in a pre-bake furnace. This type of aluminum reduction cell is most common because it is more efficient electrically and it emits fewer organic compounds than other forms of reduction cells.

The electrolyte is molten cryolite (Na<sub>3</sub>AlF<sub>6</sub>) which also serves as the solvent for alumina. The electrolytic reduction of alumina by the carbon from the electrode forms elemental aluminum and carbon dioxide (CO<sub>2</sub>). The aluminum is deposited around the carbon-lined steel shell, where it remains as a molten metal below the surface of the cryolitic bath. Using a vacuum siphon, the aluminum is removed from the pots every 24 to 48 hours and transferred to a reverberatory holding furnace. From there, it is either cast or transported to the holding facilities.

Noranda Aluminum, Inc. is considered a major source under construction and operating permits. Four separate Part 70 Operating Permits were issued to Noranda Aluminum, Inc. for the entire installation. The following permits have been issued to Noranda Aluminum, Inc. from the Air Pollution Control Program.

Table 1: Air permits issued

Permit Number	Description
0679-008	Potline I
0679-009	Alumina handling facilities associated with potline III
0679-010	Potline III
0679-011	Carbon baking furnace for potline III
1282-007A	Dross cooling system
1288-003A	Dross cooling system
0990-013	Additional melting furnace
0194-008	Reverberatory melting furnace
0894-022	Filtered exhaust system
OP2001-066	Part 70 Operating Permit Primary Aluminum Reduction Facility
OP2001-032	Part 70 Operating Permit Primary Aluminum Reduction Facility
OP2001-062	Part 70 Operating Permit Primary Aluminum Reduction Facility
OP2001-033	Part 70 Operating Permit Primary Aluminum Reduction Facility
0298-001	Replacement of existing batch mixers for anode paste with continuous mixer and the replacement of the existing hydraulic press anode mold with a turntable vibratory anode former to produce a larger single piece anode
0799-017	Addition of a downdraft welding table
082001-005	Installation of two 80,000 pound holding furnaces, 20 MMBTU per hour each

## PROJECT DESCRIPTION

Noranda Aluminum, Inc. has applied for authority to increase aluminum production at their existing installation by twelve percent. The maximum hourly design rate (MHDR) set forth in Permit Number 0679-008 through 011 was 8 tons of aluminum per hour and 9.7 tons of aluminum per hour for potline 1-2 and potline 3, respectively. Noranda Aluminum, Inc. now proposes an MHDR of 10.4 tons of aluminum per hour and 12.8 tons of aluminum per hour for potline 1-2 and potline 3, respectively.

To increase production, Noranda Aluminum, Inc. plans to increase the usage of the green anode in the production of aluminum. This will involve an increased usage of the coke and pitch necessary for the production of green anode. However, emissions from the increased handling of coke and pitch are not considered in this evaluation. Noranda Aluminum, Inc. has proposed to limit  $PM_{10}$  emissions from all coke and pitch handling operations to a value equivalent to the average actual emission rate demonstrated in the past two years.

Similarly, although ore usage will also increase with increased aluminum production, emissions from the increased usage of ore will not be considered in this evaluation. Noranda Aluminum, Inc. has proposed to limit  $PM_{10}$  emissions from all ore handling operations also to a value equivalent to the average actual emission rate demonstrated in the past two years.

These material handling emissions points are all currently controlled via baghouses to reduce  $PM_{10}$  emissions. Noranda Aluminum, Inc. contends that the hourly emission rate of  $PM_{10}$  from sources with a baghouse is constant and dependent only on the grain

loading and airflow to the baghouse. To demonstrate this claim, Noranda Aluminum, Inc. submitted a review of site specific source test data collected from baghouses for Potline 3. The results showed that particle concentration remained constant compared against a varying daily production rate. It was also noted that the baghouses and associated fans could operate only in an on/off manner, and the air flow rates remain constant.

Since this information was relied upon to estimate the potential emissions for the project, Special Condition 3 has been included that sets an emissions limitation on all material handling operations. Noranda Aluminum, Inc. is required to demonstrate compliance with the limitations by periodically testing emissions from these operations. As such, no emissions increase is expected from these emissions points.

Although green anode utilization will increase, the production of the anodes themselves will not increase. The increase in aluminum production will only increase the amount of each anode that is consumed. The non-consumed portion of the anode is cooled and ground for recycling into new anodes. The number of green anodes produced will remain the same. Subsequently, associated equipment used in anode production such as the carbon bake furnaces, boilers for the hot oil system, anode repair operations, and roof vents and fans in these areas will not experience a production increase.

Lastly, secondary aluminum production will not experience a production increase. Therefore, equipment related to secondary aluminum production such as the equipment associated with pig melters, holders, homogenizing furnaces, and roof vents and fans in the area, will not experience a production increase.

The increase in aluminum production will be accomplished by increasing the electric current sent to the aluminum pots, which will include modification to the existing electrical rectifier. Although the rectifier itself is not considered an emission point (i.e. does not emit pollutants), the installation of the rectifier is considered a modification since it is a physical change and a change in the method of operation. In this case, the applicant cannot increase the rate of production without the rectifier modification. In addition, since the proposed production rate is greater than the permitted production rate in Permit Number 0679-008 through 011, pre-construction review is necessary. Therefore, any emissions increase at the potlines due to the increase in production has been considered in the evaluation of this permit. Equipment associated with the increase in aluminum production are listed in Table 2.

Table 2: Emission Points Experiencing an Emissions Increase

Emission Point	Description	MHDR
EP-59	Monitor – Potline 1	10.4 tons of molten Al Produced
EP-60	Monitor – Potline 2	10.4 tons of molten Al Produced
EP-61	Stack for Potline 1 & 2	20.8 tons of molten Al Produced
EP-62	Stack for Potline 3E	6.4 tons of molten Al Produced
EP-63	Stack for Potline 3W	6.4 tons of molten Al Produced
EP-64	Monitor – Potline 3	12.8 tons of molten Al Produced

## EMISSIONS/CONTROLS EVALUATION

The emission factors used in this analysis were obtained from the Environmental Protection Agency (EPA) database Factor Information Retrieval (FIRE) Data System Version 6.23 using the Source Classification Codes identified in the application for each emissions point. On-site monitoring data stack performance data was also used to in the evaluation of potential emissions.

Emissions from the aluminum reduction process are primarily gaseous fluorides and particulate fluorides, alumina, carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), VOC and SO<sub>2</sub> from the reduction cells. Gaseous fluorides are emitted in the form of hydrogen fluorides. The source of fluoride emissions from reduction cells is the fluoride electrolyte, which contains cryolite, aluminum fluoride (AlF<sub>3</sub>), and fluorspar (CaF<sub>2</sub>). The dissociation of the molten cryolite is the source of the perfluorinated carbon compounds tetrafluoromethane (CF<sub>4</sub>) and hexafluoroethane (C<sub>2</sub>F<sub>6</sub>), which are produced as a result of an anode effect. Particulate emissions occur from the reduction cells and include alumina and carbon from anode dusting, cryolite, aluminum fluoride, calcium fluoride, and ferric oxide. The primary source of the CO and CO<sub>2</sub> emissions is the carbon in the anodes from the petroleum coke.

Currently, to control gaseous and particulate fluorides and particulate emissions, wet scrubbers have been applied as well as wet and dry electrostatic precipitators (ESPs), multiple cyclones, and dry alumina scrubbers. Gaseous and particulate emissions from the pots and the carbon bake furnaces are captured by enclosed hoods and drawn through a dry alumina scrubber followed by a baghouse.

Emission rates of PM<sub>10</sub>, CO and fluorides from the potlines were based on a detailed BACT analysis for minimizing these pollutants. This is discussed further in the BACT analysis section of this permit. Table 3 provides a summary of control technologies used to control potline emissions.

Table 3: Potline Emissions Control Technologies

Pollutant	Control Technology
PM <sub>10</sub>	Capture Hoods and Dry Alumina Scrubber with Baghouse
CO	Good Design and Operation
fluorides	Capture Hoods and Dry Alumina Scrubber with Baghouse

Sulfur oxides (SO<sub>x</sub>) originate from the sulfur in the anode petroleum coke and pitch and are generated during the oxidation of the sulfur in both the petroleum coke and pitch. Since the majority of the SO<sub>x</sub> emissions are generated during the oxidation of the carbon in the coke during the melting process, potential SO<sub>x</sub> emissions are dependent on the sulfur content of the coke. Noranda Aluminum Inc. has requested a de minimis limitation on the increase in sulfur emissions from the entire installation. The increase is based on the two-year past actual emissions as reported in the Emissions Inventory Questionnaire (EIQ). An outline of the emissions increase for sulfur can be seen in Table 4.

Table 4: Summary of Emissions Increase for SO<sub>x</sub>

Actual SO <sub>x</sub> emissions from the year 2001	3,669.7 tons
Actual SO <sub>x</sub> emissions from the year 2002	4,009.9 tons
Two year average actual SO <sub>x</sub> emissions	3,839.8 tons
De minimis increase	39 tons
New SO <sub>x</sub> emissions limitation	3,878.8 tons

HAPs in the form of gaseous fluorides, including hydrogen fluoride, and polycyclic organic matter, is emitted from the aluminum potlines. These emissions are limited under the MACT standard Subpart LL and are not subject to the requirements of 10 CSR 10-6.060(9).

Potential emissions of the application represent the potential of the new equipment, assuming continuous operation (8760 hours per year). Existing potential emissions were determined using information on each emission point submitted with the current application. Existing actual emissions were taken from the 2003 EIQ. The following table provides an emissions summary for this project.

Table 5: Emissions Summary (tons per year)

Pollutant	Regulatory <i>De Minimis</i> Levels	Existing Potential Emissions	Existing Actual Emissions (2003 EIQ)	Potential Emissions of the Application	New Installation Conditioned Potential
PM <sub>10</sub>	15.0	1,275	620.9	245	N/A
SO <sub>x</sub>	40.0	3,992	3,350.62	>40	3,878.8
NO <sub>x</sub>	40.0	170	38.27	0.07	N/A
VOC	40.0	78	226.53	2	N/A
CO	100.0	34,587	20,256.92	4,865	N/A
Fluorides	3.0	335	N/D	50	N/A
HAPs	10.0/25.0	N/D	135.21	N/D	N/A

\*N/A = Not Applicable; N/D = Not Determined

## BACT ANALYSIS

Any source subject to Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, Section (8) must conduct a Best Available Control Technology (BACT) analysis on any pollutant emitted in greater than de minimis levels. The BACT requirement is detailed in Section 165(a)(4) of the Clean Air Act, at 40 CFR 52.21 and 10 CSR 10-0.60(8)(B).

A BACT analysis is done on a case by case basis and is performed using a “top down” method. The following steps detail the top-down approach:

1. Identify all potential control technologies – must be a comprehensive list, it may include technology employed outside the United States and must include the Lowest Achievable Emission Rate (LAER) determinations.

2. Eliminate technically infeasible options – must be well documented and must preclude the successful use of the control option.
3. Rank remaining control technologies – based on control effectiveness, expected emission rate, expected emission reduction, energy impacts, environmental impacts, and economic impacts.
4. Evaluate the most effective controls – based on case by case consideration of energy, environmental, and economic impacts.
5. Select BACT.

The proposed phased construction is subject to the PSD regulations, which mandate that case-by-case BACT analyses be performed. As a consequence, BACT demonstrations are presented for PM<sub>10</sub>, CO, and fluorides. Emission sources considered in the analysis include the potlines 1, 2 and 3. The BACT analysis was based on the U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) database, vendor information and guarantees, and previous permits for primary aluminum plants issued in the State of Missouri and elsewhere. Since the potlines are subject to 40 CFR 63 Subpart LL and 40 CFR 60 Subpart S, the BACT determination will be at least as stringent as these standards.

### Control of PM<sub>10</sub> and Fluoride Emissions

The net emissions increase of PM<sub>10</sub> and fluoride due to the proposed modification are significant and trigger major review for each pollutant. The fluorides emitted from the potlines are emitted as gaseous and particulate fluorides. For the BACT analysis, PM<sub>10</sub> and fluoride emissions would be controlled using the same technology. Therefore, PM is being used to account for PM<sub>10</sub> and fluorides for this BACT analysis. Table 6 lists all control technologies identified in the RBLC database for the potlines with control efficiencies. All the technologies listed are technically feasible.

Table 6: PM control technologies

Control Technology	Control Efficiency
Capture Hood and Dry Alumina Scrubber with Baghouse	85-95% Capture 97% Control
Dry Alumina Scrubber with Baghouse	97%
Wet Scrubber	90%

### Rank and Evaluation of Control Options for PM<sub>10</sub> and Fluoride Emissions

#### Capture Hood and Dry Alumina Scrubber with Baghouse

Potline emissions are captured by a hood and vented through the control device, to the atmosphere through a stack. Uncaptured fugitive emissions are released from the roof vents. Capture hoods have a capture efficiency of 85-95%. The applicant has proposed 95% capture efficiency that will be maintained through an inspection and maintenance program to repair or replace damaged hoods and seals.

The potline emissions consist of gaseous fluorides and particulates that react with alumina to form a stable compound. The injection type scrubber consists of a simple vertical venturi reactor to promote the contact between the gravity injected alumina and the upflow process gases. The reactor is followed by a fabric filter, which collects the alumina and the particulate fluorides. The overall control efficiency of this system is 97%.

### Wet Scrubber

The applicant has chosen the top control alternative. Therefore, no further analysis was evaluated for the remaining control options.

### **Selection PM<sub>10</sub> and Fluoride Control Technology**

*In conclusion, for the aluminum potlines, BACT for the control of PM<sub>10</sub> and fluoride is the use of capture hoods, with a capture efficiency of 95%, vented to dry alumina scrubbers connected to a baghouse for an overall control efficiency of 97%.*

*The Potline 1 &2 Stack (EP61) must meet a PM<sub>10</sub> emission rate of 29.0 pounds per hour (1.4 pound per tons Al produced). The Potline 1 Monitor (EP59) must meet a PM<sub>10</sub> emission rate of 64.8 pounds per hour (6.2 pound per tons Al produced). The Potline 2 Monitor (EP60) must meet a PM<sub>10</sub> emission rate of 34.6 pounds per hour (3.3 pound per tons Al produced). The Potline 1 Monitor and Stack (EP59 and EP61) must meet a fluoride emission rate of 1.9 pound per ton of aluminum produced. The Potline 2 Monitor and Stack (EP60 and EP61) must meet a fluoride emission rate of 1.9 pound per ton of aluminum produced.*

*The Potline 3 East and West Stacks (EP62 and EP63) must meet a PM<sub>10</sub> emission rate of 7.25 pounds per hour (1.1 pound per tons Al produced), each. The Potline 3 Monitor (EP64) must meet a PM<sub>10</sub> emission rate of 24.4 pounds per hour (1.9 pound per tons Al produced). The Potline 3 Monitor and East and West Stacks (EP62, EP63 and EP64) must meet a fluoride emission rate of 1.9 pound per ton of aluminum produced.*

### **Control of CO Emissions**

The net emissions increase of CO due to the proposed modification is significant and trigger major review. Table 7 lists the control technologies identified in the RBLC database for the potlines.

Table 7: CO control technologies

Control Technology
Catalytic Oxidation
Thermal Oxidation
Regenerative Thermal Oxidation
Good Design/Operation

## **Technically Infeasible Control Options for CO Emissions**

### Catalytic Oxidation

In catalytic oxidation, the exhaust stream is passed over a bed of catalyst to convert CO emissions to carbon dioxide. In this case, catalytic oxidation is not considered technically feasible due to exhaust temperature and catalyst poisoning.

Typically, the exhaust stream is delivered to the catalyst at a minimum temperature of 450-500 degrees Fahrenheit. The current temperature from the primary and secondary exhaust streams for the potlines is 95-200 degrees Fahrenheit, which is too low for proper catalytic oxidation.

In addition, catalysts used for oxidation are subject to poisoning, particularly from the materials found in the potline exhaust stream, which consists of particulate matter, SO<sub>2</sub>, fluoride and metals. Due to the high concentration of these materials, chances of poisoning increases, and the feasibility of this control technology is reduced.

### Regenerative Thermal Oxidation

RTO units are distinguished from other thermal incinerators by their ability to recover heat at high efficiency. RTOs employ a multitude of chambers that store and recycle heat energy. Typically, this technology uses high temperatures to convert VOCs and other odor causing emissions into carbon dioxide and water vapor using a cycling heat recovery process. Heat recovery chambers, outfitted with ceramic beds, are used to absorb most of the heat energy from the combustion chamber and are used to preheat the exhaust stream before it enters the combustion chamber.

In order to thermally oxidize CO emissions from the potlines, auxiliary fuel must be used to produce the heat required to control CO in the RTO. An increase in fuel combustion would ultimately increase the emission of other criteria pollutants. In addition, the ceramic beds, typically used in a RTO, are comprised primarily of alumina and silica, which are susceptible to corrosion by hydrogen fluoride emissions present in the potline exhaust. Since no suitable alternative material has been found for usage in an RTO, it is considered technically infeasible.

## **Rank and Evaluation of Control Options for CO Emissions**

### Thermal Oxidation

The objective of thermal oxidation is to transform oxidizable pollutants, especially hydrocarbons, into other hydrogen compounds and carbon monoxide. To further oxidize CO to carbon dioxide would require temperatures of approximately 1,500 degrees Fahrenheit to achieve 90 to 95 percent conversion. To increase the

temperature of the potline exhaust stream, afterburner controls would be required.

For a process of this type, burning additional fuel is considered counterproductive for emission control. The conditions promoted in CO thermal oxidation are favorable for additional NO<sub>x</sub>, SO<sub>x</sub> and CO production. Any reduction in CO emissions would increase NO<sub>x</sub>, SO<sub>x</sub> and CO emissions due to fuel combustion. In fact, the amount of fuel needed to combust CO emissions would produce over 1,000 tons of NO<sub>x</sub>. Therefore, thermal oxidization is eliminated due to environmental concerns.

### Good Design and Operation

According to the RBLC database, no other primary aluminum facility has employed add-on controls for the reduction of CO emissions. For potlines at Noranda Aluminum Inc., good design and operation would result in emissions of 2,391 pounds per hour from Potline 1 & 2 Stack (EP61) and 1,469 pounds per hour from Potline 3 East Stack (EP62) and Potline 3 West Stack (EP63). Since the alternative control methods previously mentioned are considered technically or environmentally infeasible, good design and operation is considered BACT.

### **Selection CO Control Technology**

*In conclusion, BACT for the control of CO from the aluminum potlines is the use of good design and operation to meet a CO emission rate of 2,391 pounds per hour from Potline 1 & 2 Stack (EP61) and 1,469 pounds per hour from Potline 3 East Stack (EP62) and Potline 3 West Stack (EP63).*

### PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (8) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of PM<sub>10</sub>, CO and fluorides are above de minimis levels.

### APPLICABLE REQUIREMENTS

Noranda Aluminum, Inc. shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

### GENERAL REQUIREMENTS

- *Submission of Emission Data, Emission Fees and Process Information,*  
10 CSR 10-6.110

The emission fee is the amount established by the Missouri Air Conservation Commission annually under Missouri Air Law 643.079(1). Submission of an Emissions Inventory Questionnaire (EIQ) is required April 1 for the previous year's emissions.

- *Operating Permits*, 10 CSR 10-6.065
- *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, 10 CSR 10-6.170
- *Restriction of Emission of Visible Air Contaminants*, 10 CSR 10-6.220
- *Restriction of Emission of Odors*, 10 CSR 10-3.090

#### SPECIFIC REQUIREMENTS

- *Restriction of Emission of Particulate Matter From Industrial Processes*, 10 CSR 10-6.400
- *New Source Performance Regulations*, 10 CSR 10-6.070 – *New Source Performance Standards (NSPS) for Primary Aluminum Reduction Plants*, 40 CFR Part 60, Subpart S
- *Maximum Achievable Control Technology (MACT) Regulations*, 10 CSR 10-6.075, *National Emission Standards for Secondary Aluminum Production*, 40 CFR Part 63, Subpart RRR
- *Maximum Achievable Control Technology (MACT) Regulations*, 10 CSR 10-6.075, *National Emission Standards for Primary Aluminum Reduction Plants*, 40 CFR Part 63, Subpart LL
- *Restriction of Emission of Sulfur Compounds*, 10 CSR 10-6.260

#### AMBIENT AIR QUALITY IMPACT ANALYSIS

The ambient air quality impact analysis (AAQIA) must be completed for any air contaminant that exceeds the *de minimis* emission levels outlined in 10 CSR 10-6.020 subsection (3)(A) Table 1. The following table lists the air contaminants, rates of emission and their associated *de minimis* levels:

Air Contaminant	De Minimis Level	Noranda's Emission Rate in Application	AAQIA Necessary
Carbon monoxide (CO)	100.0	4,865	Yes
Particulate Matter (PM <sub>10</sub> )	15.0	245	Yes
Fluoride	3.0	50.0	Yes

Note: All number values in table have the units of measure of tons per year.

Based upon emission estimates provided by Noranda Aluminum, Inc., PM<sub>10</sub>, CO, and Fluoride exceed the *de minimis* levels, thereby triggering the requirement to perform a comprehensive air quality analysis.

The AAQIA was performed to determine the impact of PM<sub>10</sub>, CO, and fluoride emissions at or beyond the property boundary of the proposed Noranda Aluminum's facility. Additional impacts on visibility, growth, soils, plants and animals were also evaluated within the Class II area surrounding the facility. Please refer to the June 7, 2004 memorandums from Dawn Froning of the Air Quality Analysis Section, entitled, "Class I and II Ambient Air Quality Impact Analysis (AAQIA) for Noranda Aluminum, Inc.-New Madrid, Missouri" and "Class I Ambient Air Quality Impact Analysis for Noranda Aluminum, Inc. – New Madrid, Missouri."

#### STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, I recommend this permit be granted with special conditions.

Emily Enkvetchakul Wilbur  
Environmental Engineer

Date

#### PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated November 21, 2003, received November 24, 2003, designating Noranda, Inc. as the owner and operator of the installation.
- U.S. EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition.
- Southeast Regional Office Site Survey, dated March 19, 2004.

## Attachment A - SOx Compliance Worksheet

Noranda Aluminum, Inc.  
New Madrid County, S29, T22N, R14E  
Project Number: 2003-11-053  
Installation ID Number: 143-0008  
Permit Number:

This sheet covers the period from \_\_\_\_\_ to \_\_\_\_\_.  
(month, year) (month, year)

Copy as needed.

Month	Equipment Description (Note 1)	Amount of Material Processed (Note 2)	Emission Factor or Sulfur Content (Note 3)	Monthly Emissions of Pollutant (Note 4)	12-Month Emissions (Note 5)

Note 1: Description of equipment including emission point identification. This log shall include all equipment with potential emissions of SOx.

Note 2: Amount of material processed for combustion sources is the amount of natural gas/propane combusted. Units should be specified in the chart.

Note 3: The units for the emission factor used should correspond with the units used for amount of material processed. For combustion sources, the emission factor should be obtained from the EPA document AP-42. For petroleum coke, a certified sulfur content must be used.

Note 4: Amount of Material Processed x Emission Factor x 0.0005.

Note 5: Sum of last 12-months of Monthly Emissions. A 12-Month Total pollutant emissions not in excess of 3,878 tons per year from the entire installation indicates compliance.

## Attachment B – PM<sub>10</sub> Emissions Limitations

Noranda Aluminum, Inc.  
New Madrid County, S29, T22N, R14E  
Project Number: 2003-11-053  
Installation ID Number: 143-0008  
Permit Number:

Emission Point	Description	Emission Limitation	units
1	River Unloading	0.3643	lb/hr
2	River Unloading	0.3643	lb/hr
3	River Unloading	0.3433	lb/hr
4	Railcar Unloading	2.0571	lb/hr
5	Fresh Ore Material Handling	0.5143	lb/hr
6	Fresh Ore Material Handling	0.2057	lb/hr
7	Fresh Ore Material Handling	0.4936	lb/hr
8	Fresh Ore Material Handling	0.8057	lb/hr
9	Reacted Ore Material Handling	0.2571	lb/hr
10	Reacted Ore Material Handling	0.3857	lb/hr
11	Fresh Ore Material Handling	0.2207	lb/hr
12	Reacted Ore Material Handling	0.5314	lb/hr
13	Reacted Ore Material Handling	0.8113	lb/hr
14	Fresh Ore Material Handling	0.9129	lb/hr
15	Fresh Ore Material Handling	0.4071	lb/hr
16	Fresh Ore Material Handling	0.1029	lb/hr
17	Fresh Ore Material Handling	0.1029	lb/hr
18	Fresh Ore Material Handling	0.1029	lb/hr
19	Fresh Ore Material Handling	0.1029	lb/hr
20	Fresh Ore Material Handling	0.1029	lb/hr
21	Fresh Ore Material Handling	0.4071	lb/hr
22	Fresh Ore Material Handling	0.3	lb/hr
23	Fresh Ore Material Handling	0.3	lb/hr
24	Fresh Ore Material Handling	0.6	lb/hr
25	Fresh Ore Material Handling	0.3429	lb/hr
26	Reacted Ore Material Handling	0.3429	lb/hr
27	Reacted Ore Material Handling	0.0686	lb/hr
28	Reacted Ore Material Handling	0.0686	lb/hr
29	Reacted Ore Material Handling	0.0686	lb/hr
30	Reacted Ore Material Handling	0.0686	lb/hr
31	Reacted Ore Material Handling	0.0686	lb/hr
32	Reacted Ore Material Handling	0.0686	lb/hr
33	Reacted Ore Material Handling	0.0686	lb/hr
34	Reacted Ore Material Handling	0.0686	lb/hr
35	Reacted Ore Material Handling	0.1457	lb/hr
36	Reacted Ore Material Handling	0.3429	lb/hr
37	Reacted Ore Material Handling	0.0686	lb/hr
38	Reacted Ore Material Handling	0.0686	lb/hr
39	Reacted Ore Material Handling	0.0686	lb/hr
40	Reacted Ore Material Handling	0.0686	lb/hr
41	Reacted Ore Material Handling	0.0686	lb/hr

42	Reacted Ore Material Handling	0.0686	lb/hr
43	Reacted Ore Material Handling	0.0686	lb/hr
44	Reacted Ore Material Handling	0.0686	lb/hr
45	Reacted Ore Material Handling	0.1457	lb/hr
46	Electrolyte Recovery	2.6143	lb/hr
47	Electrolyte Recovery	12.8571	lb/hr
48	Electrolyte Recovery	6.1286	lb/hr
49	Electrolyte Recovery	0.24	lb/hr
50	Electrolyte Recovery	1.9714	lb/hr
55	Electrolyte Recovery	0.24	lb/hr
56	Electrolyte Recovery	0.24	lb/hr
57	Fresh Ore Material Handling	0.5143	lb/hr
58	Electrolyte Recovery	1.0286	lb/hr
65	Petroleum Coke Handling	0.3429	lb/hr
66	Petroleum Coke Handling	0.3429	lb/hr
67	Petroleum Coke Handling	0.1286	lb/hr
68	Primary Crusher (North)	0.8571	lb/hr
69	Primary Crusher (South)	1.3714	lb/hr
70	Tertiary Crusher	1.1957	lb/hr
71	Anode Paste Production	0.1286	lb/hr
72	Anode Paste Production	0.3429	lb/hr
73	Anode Paste Production	1.5103	lb/hr
74	Anode Paste Production	0.2229	lb/hr
75	Anode Paste Mixer Exhaust	0.9857	lb/hr
79	Anode Cleaning Station	0.4286	lb/hr
80	Fresh Ore Handling	0.2057	lb/hr
81	Fresh Ore Handling	0.0279	lb/hr
82	Anode Stem Cleaning (Phase I)	0.768	lb/hr
83	Cathode Casting Station	0.5186	lb/hr
84	Anode Stem Cleaning	0.462	lb/hr
DW	Potline Crushing	3.7543	lb/hr

